Optically Perfect Reflective Surfaces Composed of Structured Transverse Free Electrons

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Introduction

Although the concept of using free electrons as a reflect surface was first postulated by this author in 24 October 2023, the application the author had in mind was permitting the accumulation of LASER light between two reflective surfaces which would otherwise be melted by the sort of extremely intense LASER sources used for missile defense applications.

The purpose of this abstract is to explore the possibility of exerting finer control over electron position in planar electron beams to be used in conjunction with moderate-strength LASERs used in transistor photofabrication in order to overcome limitations imposed by “wavefront error” to further transistor miniaturization within the traditional photofabrication paradigm. Although this author believes that paradigm to be in dire need of supplantation with more advanced architecture assembly methods (several proposals for which have already been promulgated by this author,) precision mirrors have many applications whereas photofabrication is only one of those applications. Regardless of whether traditional photofabrication continues to be employed, the endeavor to create more perfect mirrors is worthy of continued research attention.

Abstract

Although current techniques allow for mirrors of remarkable precision to be created using reflective materials, these mirrors are not “perfect.” In photofabrication, wavefront error is a problem, as is the number of mirrors used. As more mirrors are utilized, wavefront error increases exponentially. One objective of the designers of lithography machines has been to reduce the number of mirrors needed to carry out photofabrication. Another has been to improve the quality of the mirrors.

In terms of improving the quality of mirrors, one apparent possible solution is to discontinue the use of physical reflective surfaces entirely *and to instead use structured free electrons emitted on a transverse basis in order to reflect light*. Although a fair bit of engineering would be required in order to emit electrons in such a way so that their position relative to one another would be a match for the electrons in the electron clouds of known reflective materials, if such a capability were developed, it would, in theory, allow for a greater degree of optical control over the reflected light.

The LASER epitaxy process used to create thin, alternating layers of molybdenum and beryllium, for example, involves heating (literally vaporizing) materials so that they may be deposited upon a surface. Although this mechanism allows for layers of precise thickness to be created, the *density and relative configuration* of the atoms in each layer are varied largely as a

consequence of inconsistent temperature. Not only does the LASER epitaxy process heat each individual atom unevenly, but the rate of vaporization can result in hot atoms landing upon hot atoms or it can result in hot atoms landing upon cold atoms. Depending upon which is occurring, the way the atoms “settle” will be different, resulting in variances in density even when the number of total atoms is the same.

Because free electrons do not have a per se temperature and because free electrons would be continually replenished by new electrons, their relative configuration could be more precisely controlled than could the configuration of physical materials at such a scale. The reflective properties of physical materials are ultimately governed by their electrons and the nucleus of the atoms making up those materials introduces a dimension of thermal variation which is complicating to the objective of creating an “optically perfect” mirror.

Conclusion

Efforts should be made to discover how to precisely control free electrons so that they may be emitted in clusters which emulate the count and configuration of of the electrons in known physical materials in support of applications calling for optically perfect mirrors.